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ABSTRACT

Eighteen children (12- to 15-years-old) with learning disabilities and behavioral problems were assessed to determine the effect of desk calculators on student achievement, attitude, and behavior. The Ss, whose IQs ranged from 68 to 116, used four calculators in a mathematics class to check answers of mathematics problems for 6 months. Comparison of pretest and posttest data showed significant increases in student interest and positive attitudes towards mathematics, and reduction in disruptive behavior. (Author/MC)

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A RESEARCH REPORT

THE EFFECT OF THE USE OF DESK CALCULATORS ON ACHIEVEMENT AND ATTITUDE OF CHILDREN WITH LEARNING AND BEHAVIOUR PROBLEMS

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RESUME

TITLE: The effect of the use of desk calculators on achievement and attitude of children with learning and behavior problems.

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DATES OF EXPERIMENT: January to June 1972

ABSTRACT

The report describes an experimental study conducted in a special class of 18 children (ages 12 to 15 years) with Learning and Behavior Problems for the purpose of determining the feasibility of using desk calculators in conjunction with classroom instruction in mathematics and their effect on the achievement, attitude and behavior of these children. Mathematics achievement was based on the results of the pre-test and post-test scores of the Stanford Achievement Test. Four calculators were placed in a corner of the classroom and students were encouraged to check their answers of math problems related to classroom work. The teacher also used the machines as a tool for the enrichment and reinforcement of a new unit. Comparison of the pre and post scores showed a significant difference (.01 level of confidence) and an analysis of questionnaire data indicated marked increases in student interest and positive attitudes toward mathematics. The author concludes that the use of calculators can facilitate mathematics instruction in a special class, provide a variety in the classroom, help release frustrations children have due to inaccessible numbers and help teachers in individualizing the math instruction.

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INTRODUCTION

"Probably the greatest revolution in the teaching of arithmetic is the introduction of calculating machines." (6) Technology is gradually playing an important role in the present day education. We do find that some of these mechanical gadgets are able "to execute rather elaborate series of instructions (programs) and in many cases adequately serve the instructional needs of the students." (14)

STATEMENT OF THE PROBLEM

To determine whether or not Desk Calculators can be used in conjunction with classroom instruction in Mathematics with the children with Learning and Behavior Problems.

To determine whether or not the use of these machines will have any effect on the achievement, attitude and behavior of the students.

HYPOTHESES

In an attempt to answer these problems the following hypotheses were formulated:

a. the use of the Desk Calculators in a class of children with Learning and Behavior Problems will result in their greater achievement on Standardized Tests,

b. the use of the Calculators will have a positive effect on the students' self-confidence and attitude toward learning thus improving their classroom behavior.

PROCEDURE

The criteria used to determine Mathematical Achievement of the 18 students were the results of Pre and Post tests on Stanford Achievement Test (Intermediate I - Partial Battery). The change, or difference, in the scores of each student was determined and the t - test of the differences between these mean differences was used, with the 5 percent level of confidence as the criterion for rejecting the null hypothesis.

EDUCATIONAL TREATMENT

Because these students were working at their individual levels in mathematics they were encouraged to complete their unit of work and then go to the calculators to check the answers.

When the teacher introduced a new unit with one student or a group of students which lent itself to reinforcement and enrichment by supplementary use of the calculators he brought that student or group to the Math Centre set in the far corner of the classroom and encouraged them to solve the problems of similar nature from the teacher prepared laboratory worksheets.

Quite often students brought the receipts of the grocery and other purchases made by their families and checked the totals on the machines.

SOURCES OF DATA

The study was conducted with eighteen boys and girls attending a special class at Victoria Public School, Kingston, Ontario. These youngsters, who were 12-15 years in age, were Educable Mentally Retarded and Neurologically Impaired. They had I.Q. scores of about 68 to 116. The Calculators were

received by the courtesy of local Olivetti Underwood dealer for a period of six months (January to June 1972). As the author himself was the teacher in-charge of the class, it helped keeping teacher variable relatively constant.

EARLIER EXPERIMENTS

After reviewing the past issues of "The Mathematics Teacher", an official journal of the American National Council of Teachers of Mathematics; "The Arithmetic Teacher" and ERIC (Educational Resources Information Center, U.S. Dept. of Health, Education and Welfare) Education Abstracts, I found a few articles and researches regarding the use of Calculating Machines in the regular classrooms but none referred to their use with the children with learning and behavior problems. Schlauch (11) in his study "The Use of Calculating Machines in Teaching Arithmetic" reported that the machines were a strong motivating force with no sacrifice of analytic skills.

Marsh (9) and Keough et. al (7) found that the use of calculators resulted in better achievement in mathematics.

Shoemaker (12) has developed materials employing the desk calculators in the High School Classroom claiming

> "The calculator is a very important segment of the mathematics laboratory. During the past few years, hundreds of instructors have found very favourable results in using the calculator as a means of reaching the slow achievers." (Page 24)

Broussard, Fields and Reusswig (3) stated that a program for low achievers from disadvantaged areas which emphasized real world applications and use of flow charts, calculators, and other materials resulted in significant achievement gain.

Beck (2), Stengel (13), Corenendyk (5), Longstaff, Stevens and King (8) found that motivation of the students was improved by the introduction of desk calculators into the classroom thus resulting in better attitude toward the subject. Reynolds (10) and Traverse and Knaupp (15) have urged the early introduction of computational aids in the elementary school curriculum. On the other hand, Cech (4) in his recent study conducted in a suburban High School of Illinois did not find improvement in the achievement or attitude of the ninth graders. It, however, supported the hypothesis that the students could compete better with calculators than without them.

FINDINGS

TABLE 1

Comparison of the Pre - and Post - Test Scores (N:18)

	Mean Score	t
Pre-Test	40.5	3.09
Post-Test	43.0	
p < .01		

Table 1 shows that the post-test scores were higher than the pre-test scores and the difference was significant at the .01 level of confidence.

Student Interest and Attitudes

An analysis of questionnaire data indicated marked increases in student interest and positive attitude toward mathematics. When asked whether they would like to work on the calculators on the permanent basis, 17 out of 18 students answered affirmatively. One girl did not like the noise of the calculators while she was trying to concentrate on her work.

Students offered the types of responses categorized in Table II to an open-end item asking what was of most value doing math with the aid of the calculators.

TABLE 2

Strength of Calculator Assisted Instruction

(N=18)

Responses	Frequency
It helped me understand better	6
It gives you the correct answer when you are wrong	5
It is fun	4
It is faster	3

Success breeds success, and failure does not provide motivation for learning nor does it release energy for learning. The self-image of a child with learning and behavior problems, like any other child, is enhanced by experiencing success and diminished by frequent failure. Many of these children lack both hope of achievement and fear of not achieving. Machines helped in removing the fear of failure and provided structure through which child understands the computation process more clearly. Interest in math picked up and the children who were formally disinterested started finding problem solving a great fun.

In the beginning, students appeared rather overwhelmed with the complexities of the machines, but after this initial demonstration by the teacher, the enthusiasm and desire to master the "mechanical genius" rose. It didn't

take them long to handle the 'tool' successfully.

Through these calculators it was easy to explain the why's of multiplications and divisions to some students. Most of the students gained an understanding of negative integers by using the calculators.

The presence of the calculating machines in the classroom brought a remarkable change in the behavior of the students. The calculators brought variety in the class. These children, who have comparatively short attention span, find it difficult to sit at one place for 40-45 minutes and concentrate on a task. A chance to go the calculator did provide a change or a kind of rest and eased the tensions. Disruptive students became pleasant and the classroom atmosphere calmer and more controllable.

CONCLUSIONS

Based upon the data gathered from testing procedures and questionnaires, the following conclusions were drawn:

1. The students showed significant gains in Stanford Achievement Test scores from pre-test to post-test.
2. The attitudes of the students after working with the calculators for six months improved.
3. The calculators proved a help to the teacher in individualizing his instruction.
4. Calculators provided a variety in the classroom.
5. Calculators helped releasing some of the frustrations children had due to inaccessible numbers which resulted in better behavior.

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It may be suggested that further studies be conducted to determine the effectiveness of the calculator at different levels with the Exceptional Children and under varying conditions.